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RAPTOR CONTROL OF GOPHER POPULATIONS BY THE USE OF PREY PERCHES

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Progress Report to The Uinta National Forest

January 1, 1972

RAPTOR CONTROL OF GOPHER POPULATIONS BY THE USE OF PREY PERCHES

by

Robert C. Christensen

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INTRODUCTION

The following is a report of research conducted in Strawberry Valley, Wasatch County, Utah, from May 26, 1971, to October 22, 1971, and is concerned with the use of prey perches by raptors in controlling mountain pocket gopher populations. The research problem initially began on June 18, 1970, and a report was submitted to the Uinta National Forest for the 1970 period on January 1, 1971. Some comparisons of 1970 and 1971 data are included in this report. The 1971 research was conducted within the same study areas as the 1970 research, the main area being the Sink Hollow area of Strawberry Valley. The area of lesser importance was Big Flat which is on the Mud Creek road west of Strawberry Reservoir. See the 1970 report for a map and data about the perches.

The objectives of the 1971 research were the same as those stated in the 1970 report. The equipment used was generally the same, however an addition to the observational equipment was made by the introduction of an infrared motion picture detecting device. This was set up to detect bird activity on the perches. The type of traps used in trapping procedures for 1971 were changed. Live-traps were unavailable for use, so snap-traps were used in their place.

Methods and procedures were essentially the same for both seasons, however the method used in counting gopher mounds was changed to a transect count in order to allow a better statistical analysis to be made of the relationship between the distance from each perch and the number of gopher mounds.

1971 RESULTS

Raptor Nests:

The timber stands within 1.5 miles of Sink Hollow were searched for possible raptor nests. This search was conducted from June 18 through July 7. A small inactive nest, possibly that of a kestrel (sparrow hawk), Falco sparvarius, or an accipiter, was located on the ridge just north of Sink Hollow. The only active nest located was that of a long-eard owl, Asio otus. This nest was in a small white fir tree, Abies concolor, among a mixed conifer and aspen, Populus tremuloides, stand. This stand was located on a northeast facing slope. There were two owlets in the nest when it was first visited on June 18. They were quite bare with only a little down covering them, and were no more than 2 weeks old. Both parents were seen in the area. They screeched and whined while the nest was being searched. One owl pellet was taken from the nest at this time. When the nest was visited on July 7, the owlets were gone and only feathers and pellets remained. During this visit a total of 7 pellets were collected from the nest and from the ground beneath the nest.

On several occasions raptors were observed flying in and out of conifer stands in the area, but a search of these stands revealed no raptor nests. The behavior of a particular kestrel indicated that it may have had a nest just north of the long-eared owl nest, but upon searching the area no nest was found. There may have been a red-tailed hawk, Buteo jamaicensis, nest several miles to the east, on the other side of the hills from the main valley. Adult red-tails were seen flying in and from that direction several times during June, and later in August several immature red-tails were observed chasing and soaring in that general direction.

Raptor Use of Perches:

Raptor use of prey perches and telephone poles may be determined by a variety of factors. Some of the factors are ocular observation, a camera detection system, pellets and other prey parts found per unit of time, feathers collected from under perches, and the size and frequency of fecal deposits.

Perch No. 1

Raptors made good use of perch no. 1 during the 1971 season. They were observed perched on the crossarm or on top of the pole. The first sign of raptor use on this perch was May 26. On this day a pellet was found with the remains of a vole, Microtus sp., and 2 shrews, Sorex sp. Although use of the perch during the month of June was slight according to detectable signs, more active use was observed in July and August. During this time a motion picture detecting device, which was supplied by the Forest Service, was set up 50 feet south of the perch. The camera observations confirmed that the perch was being used by many different kinds of birds. Small birds; medium-sized birds, i.e., meadow larks, morning doves, and kestrels; and large rapacious birds, were detected on the perch. The camera device helped substantiate the time of day the perch was visited by various raptors.

From June 29 to August 18, the camera detected a Swainson's hawk, Buteo swainsoni, upon the perch on 15 different occasions. This particular hawk frequented the Sink Hollow area during both the 1970 and 1971 seasons. The camera worked only during the daylight hours, and the film often ran out a day or so before it could be changed. According to personal observation and the camera detection system, the Swainson's hawk seldom visited the perch other than the morning and evening hours. A red-tailed hawk was detected by the camera in the early afternoon on August 7. Kestrels and other small birds frequented the perch throughout the day.

By the end of August, use of no. 1 perch began to decline. The last noticeable use of the perch by raptors was on September 28 when gopher remains were found under it.

Perch No. 2

No. 2 perch was frequented more during 1971 than 1970. The first recorded use was on May 26 when 3 pellets and a gopher skull were found under the perch. During June the perch was visited very little, but use increased during July. On July 20 at 6:30 a.m. a Swainson's hawk was observed on the perch. Detectable signs of use were few during August, but picked up during September. The last sign of raptor use was on September 28 when large fecal deposits and pieces of rodent gut were discovered beneath the perch.

Perch No. 3

The use of perch no. 3, which sits inside Sink Hollow, greatly increased during 1971. The first sign of use was on May 26 when a buteo flight feather was found. The next noticeable sign was not until June 24 when gopher osteo-remains were discovered. There was slight use in July and then heavy use in August and the later part of September. In August, Swainson's hawks were the main visitors to the perch. They were observed around the perch several times and often flew out of the timber screeching when the perch was approached. On August 10 at 8:15 p.m. a Swainson's hawk was observed on no. 3 perch. This particular bird had not been seen in the area before this time.

Only red-tailed hawks frequented perch no. 3 during the latter part of September and into October. They were seen throughout the area at this time, and the size and nature of the raptor pellets collected were characteristic of red-tails. The last sign of use of this perch was on October 22 when 2 large pellets were found in addition to several large fecal deposits.

Telephone Poles

The telephone poles in the Sink Hollow area were used extensively by raptors, especially by kestrels which were very numerous around the valley

from July through September. The crossarms on the telephone poles of the main line have wires only on the south arms. The bare north arms and the tops of the poles were used most frequently by the various raptors.

When the study area was first visited on May 26, there were many raptor signs under the poles of the main telephone line. These were not recorded or collected until June 7, at which time a total of 12 raptor pellets were gathered from under 8 telephone poles. There seemed to be moderate use of the poles on the main line during June and July. A Swainson's hawk was seen on several occasions using the poles during this time. Use of the poles increased in August when Swainson's hawks were seen frequenting the poles; subsequently prey remains increased under the poles. In September active use of the main telephone line declined considerably. September 11 was the last day this line was inspected for prey remains and pellets, and it yielded only 2 kestrel pellets and the remains of one vole, Microtus sp.

There is an old telephone line which breaks off the main line in the middle of the valley and runs SSW across the valley to the head of Daniel's Canyon. The wire on this line has long since been removed and there are no crossarms on the poles. As far as could be determined, the poles on this line received only slight use by large raptors during the 1970 season. However, their use increased considerably during the 1971 season. Use was slight in June and July, but heavier in August and September. A Swainson's hawk was observed hunting from the poles of this old line on July 31 at 7:00 a.m. and again on August 3 at 7:45 a.m. Two raptor pellets were picked up under the poles on June 28, but on August 3 seven pellets were collected along with 3 buteo feathers. Red-tailed hawks were observed using the old telephone poles on September 4 at 10:30 a.m. and on October 22 at 3:45 p.m.

Big Flat Perch

Raptors evidently used the perch on Big Flat considerably during May and maybe the early part of June. The first visit to this perch on June 6 revealed 3 pellets, however these were the only pellets collected under the perch during the season. A few feathers and fecal deposits were detected near the perch during the course of the summer from June to October, but no extensive use was noticed. The raptors in this area have plenty of aspen trees to perch in. The Big Flat area is a small enough clearing that the hawks and owls have good vantage points from the aspens surrounding the edges. The perch is only about 150 feet out onto the flat from the aspens, consequently its use may not be that much more advantageous over the use of the aspens.

Although only the specific use of the perches and telephone poles has been discussed, many other observations were made of raptors in the study area. Some were flying or soaring, while others were sitting on the ground or perched in trees. Bare branches on conifers and aspens appeared to be an important part of the habitat for rapacious birds. In many cases the tree perches used by raptors were dead trees located along the tops of the hills and ridges. These trees probably aided the raptors in the same manner as the telephone poles and manipulated prey perches. However, the dead trees because of their location may have an added advantage for territory surveillance. It was observed that raptors perched in these trees screeched their defiance at both other raptors and humans who invaded their territory.

Analysis of Pellets and Prey Remains:

During the 1971 period regurgitated raptor pellets, bone fragments, and other prey remains were regularly collected from under perches and telephone poles as well as from any other located sources. Analyses of these collected materials were later made in order to determine the prey species present. The

results of these analyses follow.

Perch No. 1

A total of 9 raptor pellets were collected under perch no. 1. Seven of these contained the remains of mountain pocket gophers, Thomomys talpoides, and at least 2 of the 7 pellets had the remains of 2 gophers per pellet. One pellet contained only the remains of 1 deer mouse, Peromyscus sp.; and still another pellet contained remains of 2 shrews, Sorex sp., and 1 vole, Microtus sp. Other items found in these pellets were pieces of bark and insect remains. Osteo-fragments and prey parts found under no. 1 perch accounted for 5 gophers, 1 vole, 1 Uinta ground squirrel, Spermophilus armatus, and 1 lagomorph (rabbit), Lepus sp.

Perch No. 2

Three of 12 pellets found under no. 2 perch where kestrel pellets which contained only insect exoskeletons. Seven pellets contained pocket gopher remains with one of the 7 having also lagomorph, Lepus sp., remains in it. Another pellet accounted for 1 Uinta ground squirrel, and also 1 myomorph rodent, either Microtus sp. or Peromyscus sp. A pellet which appeared to be that of a kestrel had the fur and osteo-remains of a shrew, Sorex sp. Other prey individuals from analysis of bone fragments and prey remains were 3 gophers and 1 Uinta ground squirrel. On two occasions unidentified pieces of rodent gut were found.

Perch No. 3

Fourteen raptor pellets were found under no. 3 perch during the season. Most of these were found toward the end of the season from August to October. Of the 14, three were kestrel pellets containing rodent fur and insect exo-skeletons. One of these 3 had incisors in it indicating the presence of myomorph remains. Eight pellets accounted for 8 different pocket gophers, but of these 8, three also had in them the remains of voles. Two separate

pellets contained only myomorph remains, 1 Microtus sp. and 1 unidentified. One other pellet had only Uinta ground squirrel remains. Other items found in the pellet analysis were strands of grass, buckwheat seeds, and pieces of bark. Bone fragments found under the perch accounted for 4 pocket gophers.

Main Telephone Line

Twenty-one intact pellets were located under the various poles of the main telephone line which transects the valley from east to west. Of the 21 pellets, 14 contained gopher fur and osteo-remains. At least 2 of these 14 pellets had the remains of 2 pocket gophers per pellet. Three of the 14 also had various myomorph remains in them, 1 Microtus sp., 1 Peromyscus sp., and 1 unidentified. One pellet contained only the remains of a deer mouse, Peromyscus sp., two others had remains of voles, and another the remains of an unidentified myomorph. Two separate pellets contained bones and fur of only Uinta ground squirrels. The fur of an unidentified rodent made up the contents of one pellet. Other things found in raptor pellets under the main telephone line were pieces of bark and insect parts. Bone fragments and other prey parts found under the poles accounted for 11 gophers, 2 voles, 3 Uinta ground squirrels, at least one passerine bird, and various insects.

Old Telephone Line

During the 1971 season 16 raptor pellets were collected from under the poles of the old telephone line. Five of these pellets were those of kestrels, and contained only insect exoskeletons. Eight of the pellets contained gopher remains, and at least one of the 8 had the remains of 2 gophers in it. Another of the 8 contained unidentified myomorph remains. Two pellets had as their contents only vole remains. Another had only the remains of an unidentified myomorph. Floral parts were found in one pellet. Bone fragments and prey parts under the poles showed remains of a vole, a lagomorph, and at least one passerine bird. On one occasion gut remains of an unidentified rodent were found.

Other Pellets Found

In addition to pellets found under perches and telephone poles, several pellets were collected from other sources. Eight intact pellets were found in the active long-eared owl nest. Of these 8, only 1 had gopher remains in it. The other seven contained myomorphs, 4 Microtus sp. and 3 unidentified. A peculiarity of all the long-eared owl pellets was that they had a characteristic greenish color. The fur and bone fragments in the pellets took on this greenish coloration.

A pellet was picked up under a conifer about 0.66 miles north of the owl nest. This pellet appeared to be that of an owl and contained remains of at least 2 voles. A pellet was also found on top of a ridge just southwest of Sink Hollow under a conifer. Because of its size and shape this pellet appeared to be that of a red-tailed hawk. It contained partial remains of a lagomorph. Finally, a pellet was found on the embankment of the stock waterhole in Sink Hollow. This also appeared to be that of a large hawk. Its contents were gopher remains and several twig ends.

Big Flat Area

The 1971 season yielded only a few raptor pellets from Big Flat. Three pellets were found under the perch on the flat on June 7. One of these contained only gopher remains. Another contained the remains of a gopher and a vole. The third had remains of a gopher and a lagomorph, Lepus. sp. Only one other pellet was found in this area all season. This was located under an aspen tree from which a red-tailed hawk had just previously been flushed. The contents of this pellet showed remains of at least 1 gopher and 1 vole.

See table no. 4 for summary of pellet numbers and prey individuals found in pellets and other prey remains.

Trapping Results:

The trapping during 1971 was conducted about a month earlier in the season than that done during 1970. The reason for this difference was partially due to convenience, and also in order to find out if earlier in the season there possibly would be a difference in the relative numbers of small mammal species. Sufficient time could not be arranged to conduct the trapping more than once during each season.

A one acre plot around each perch in Sink Hollow was trapped for 3 nights using a grid of 100 snap traps. The bait used was oatmeat mixed with peanut butter and a little bacon grease. The trapping around perch no. 1 was conducted during the nights of July 30, 31, and August 1. This period was characterized by warm, clear weather. The catch consisted of 2 deer mice, Peromyscus maniculatus, 2 mountain voles, Microtus montanus, and 1 mountain bluebird. The area around no. 2 perch was trapped on the nights of August 3, 4, and 5. It was quite rainy and cloudy during this period. Trapping yielded 1 deer mouse, P. maniculatus, 2 mountain voles, M. montanus, a Norway rat, Rattus norvegicus, and 2 pocket gophers, Thomomys talpoides. As in 1970, the results of 1971's trapping around no. 3 perch yielded the best results. Weather conditions were fair and warm. From trapping conducted on the nights of July 27, 28, and 29, the following were caught: 6 deer mice, P. maniculatus, 2 mountain voles, M. montanus, a vesper sparrow, and a white-crowned sparrow. Two traps were carried away, possibly by Uinta ground squirrels. Squirrels were observed throughout the area during the trapping periods. See table no. 1 for comparison of 1970 and 1971 trapping results.

The numbers of deer mice were rather consistent for both years in the respective areas. Mountain voles may have increased over the 1970 level. Long-tailed weasels, rats, and salamanders may be only minor constituents of the habitat, found in localized areas. Uinta ground squirrels are fairly numerous, but difficult to trap with small live-traps and snap-traps. The

Table 1

*COMPARISON OF 1970 AND 1971 TRAPPING RESULTS

	Perch No. 1		Perch No. 2		Perch No. 3		*Control Plot	
	1970	1971	1970	1971	1970	1971	1970	1971
Deer Mice	0	2	1	1	11	6	1	
Long-tailed Weasel	1	0	0	0	0	0	0	
Mountain Vole	0	2	0	2	0	2	1	
Pocket Gopher	0	0	0	2	0	0	0	
Rat	0	0	0	1	0	0	0	
Salamander	0	0	0	0	2	0	0	
Uinta Ground Squirrel	0	0	0	0	1	0	0	
Small birds	3	1	1	0	0	2	2	
Total	4	5	2	6	14	10	4	

*A control plot was not trapped during 1971.

occurrence of pocket gophers in the traps is probably due to the dark, stormy weather incurred during the 1971 trapping around perch no. 2. This also may account for the trapping of the salamanders during the 1970 season.

Gopher Mound Counts:

A transect method was used for counting gopher mounds during the 1971 season. These counts were made between September 28 and October 7 from each of the perches and the main telephone line in the Sink Hollow area as well as from the Big Flat perch. The method used was to select four random directions, on a 360° scale, from each point of reference. Each direction was in a separate 90° quadrant. The new gopher mounds were then counted in fifty consecutive 0.01 acre plots along each transect. The plots were measured by using a 6.6 ft. X 6.6 ft. rectangle made from 3/4 inch conduit. The rectangle was flipped end over end fifty times along each of the four transects. This gave

a total of 200 mound counts for each point of reference. The total area included in the four transects was 2 acres.

The mound counts were then statistically analyzed by regression analysis to determine if there was a significant relationship or correlation between the distance from each perch and the number of gopher mounds present. Table no. 2 presents the results of the computerized analysis.

From the table it is evident that in the cases of perches no. 1, 2, and 3 there is a significant relationship between the number of gopher mounds present and the distance from the perch. In the case of perch no. 1 there is a 99.5% probability that the change in gopher mound numbers is related to the distance from the perch. The R^2 value indicates that at least 4.85% of the increase in the number of mounds is due to the increased distance from the perch. For perch no. 2 there is a 90% probability that the change in mound numbers is related to distance from the perch. Only 1.83% of the increase in mounds is attributable to the increased distance from the perch. The probability for the relationship between mound numbers and distance from perch no. 3 is 99.5%. Seven point two eight percent of the increase in mounds is attributable to the increased distance from the perch.

The data for the mound counts near the perches in Big Flat and Sink Hollow were manipulated to get a ratio of the number of mounds per 0.10 acre around each perch to the number per 0.10 acre at a distance of 100 feet from each perch. The perch was the center of the first plot and the 100 foot mark was the center for the second. The purpose for this manipulated ratio was to establish a comparison with the 0.10 acre mound counts of the 1970 season. The results of this comparison are shown in table no. 3.

There may be no significance to the relationship of these ratios, but it does show how much they can differ over a year's time. Only a very small percentage, if any, of this change may be attributable to raptor predation.

Table 2

RELATIONSHIP OF DISTANCE TO NUMBER OF GOPHER MOUNDS

Point of Reference	Mean no. of Mounds per 0.01 Acre	Standard Error of The Mean	F-value at 199 d.f.	Level of Significance .75	.80	.85	.90	.95	.975	.995	Correlation Coefficient (R)	R^2
Perch No. 1	.7950	1.5860	10.09055							X	.22021	.04849
Perch No. 2	.9000	1.6564	3.68974					X			.13526	.01829
Perch No. 3	.7750	1.1581	15.54416							X	.26980	.07279
Telephone Line	.8250	1.3907	.62450	Nonsignificant								
Big Flat Perch	.8550	1.2776	.09255	Nonsignificant								

Table 3

RATIO COMPARISON OF 0.10 ACRE MOUND COUNTS FOR 1970 & 1971

	1970		1971	
Perch	Count at Perch	Count 100 ft. From Perch	Count at Perch	Count 100 ft. From Perch
No. 1	1 : 1.5		1 : 2	
No. 2	1 : 0.62		1 : 1.3	
No. 3	1 : 0.92		1 : 2	
Big Flat	1 : 0.96		1 : 3.3	

These ratios along with the variance estimates of the transect counts show that the gopher mounds are by no means random or uniform throughout the area. Different vegetation types, soil types, topography, and predation pressures have an effect on gopher distribution. A $\underline{X}^2$ test on the sample variance of each group of mound counts showed a significant departure from random distribution at the .995 level, indicating a clumped distribution for gopher mounds.

DISCUSSION AND CONCLUSIONS

The Strawberry Valley area appears to be a suitable habitat for many types of raptors. Although only one active raptor nest was located, it is evident from the influx of young birds in the latter part of the season that many raptors are nesting in the area.

The important raptors using the perches and telephone poles in the Sink Hollow area were red-tailed hawks, Swainson's hawks, long-eared owls, and kestrels. Great horned owls were known to use the perches during the 1970 season, but there was little positive evidence of their presence during 1971.

Other raptors and associated birds were also observed in the study area. Two golden eagles, Aquila chrysaetos, were observed soaring over the hills east of Sink Hollow on June 28. They were being harrassed by a small kestrel. Harriers (marsh hawks), Circus cyaneus, were identified in the Sink Hollow area from August through October. Turkey vultures, Cathartes aura, and ravens, Corvus corax, were seen throughout Strawberry Valley during summer and fall. A pair of sandhill cranes, Grus canadensis, were in the Sink Hollow location during 1970 and 1971. They successfully nested and raised one young bird during the 1971 season.

A general trend of raptor movement into and out of the area was noticed both in 1970 and 1971. This trend was detected by ocular observation and by prey signs under the perches and poles. In the spring, May through June, the area is probably frequented by migratory and nesting raptors which use the perches and poles in search of food. The migrants may possibly stay a short time before moving on to their ultimate destinations. Once most of the migrants have passed through, red-tailed hawks are the prominent raptors in the valley until the last of June and first part of July. At this time they seem to move into the higher areas, and the first of July Swainson's hawks appear. One particular dark phase Swainson's frequented the Sink Hollow perches and telephone poles from the first of July until the first part of September both seasons. This was the only Swainson's in the immediate area during 1970, but in the early part of August 1971, it was joined by a typically colored adult Swainson's and 2 darker colored, immature birds. At this time several other Swainson's were noticed around the adjoining areas in Strawberry Valley. The Swainson's hawks migrated from the area by early September.

Red-tailed hawks are the primary raptors found in the valley from the first of September through October. Sub-adult red-tails move into the valley from nesting sites during the early part of August while adults linger in the higher areas until September. Red-tails then seem to stay in the area until forced

out by climatic conditions; e.g., an adult red-tailed hawk was observed in the Sink Hollow area as late as October 22, and there had been two major snow storms before this time. However, most of the snow had melted after each storm.

Kestrels are in the valley all season, but their numbers are few until about the later part of July when they gradually increase, and are very numerous until mid-September. Their numbers begin to slack off after this time, but one kestrel was seen in the Sink Hollow area on October 22, 1971.

The movement of owls in the area is rather difficult to detect, but the long-eared owls would have had to arrive in the valley by mid-May in order to lay and hatch their eggs by early June. They probably stay until October. A long-eared owl was observed at night along the Mud Creek road on August 31, and another bird which appeared to be a long-eared owl was seen at dusk in Sink Hollow on October 7, 1971.

Harriers were not noticed in the Sink Hollow area during the 1970 season, but were quite prevalent during 1971. They appeared in the area during August, and were observed as late as October 22. All those seen were either females or juveniles because of their dark plummage.

From analysis of raptor pellets and other prey remains, it is obvious that pocket gophers make up a substantial part of the diet for the valley's raptor populations. Swainson's probably take the larger percentage of gophers, but red-tails also prey upon them. This gives a good indication that gophers must be somewhat active in the daylight hours. Swainson's hawks are more crepuscular in their hunting activities, but they are also active in the morning and early evening hours. Red-tailed hawks are more diurnal and less crepuscular in their hunting habits. Owls, especially great horned owls, may account for a few of the preyed upon gophers when the birds are in the area. Long-eared owls probably rely more heavily on smaller mouse-type rodents for food, although they do take a small number of gophers. Harriers in the area probably take a few gophers as well as other rodents and birds. Kestrels prey upon very few

pocket gophers, and depend mainly on smaller rodents, birds, and insects for their sustenance.

Throughout 1970 approximately 37 to 40 raptor pellets were collected under perches and telephone poles. Eighty-seven % of these contained gopher remains, 46% contained (Mouse-Type) myomorph remains, 30% contained both gopher and myomorph remains, and 8% contained remains of other prey victims. From both pellet and other collected prey fragments there were a total of 62 prey individuals. Of these, 64.5% were gophers, 25.8% were myomorph rodents, and 9.7% were other species.

During 1971 approximately 71 pellets were collected from under perches, telephone poles, and a few other locations (excluding the long-eared owl nest). Of these 71 pellets, 70% had gopher remains, 34% had myomorph remains, 13% had both gopher and myomorph remains, and 17% contained other prey species. From both pellet and other collected prey remains there were 130 prey individuals accounted for. Of these, 59.2% were gophers, 21.6% were myomorphs, and 19.2% were other prey species. See table no. 4 for summary of pellet and prey analysis.

The results of the gopher mound counts indicate that there is a reduction in the number of mounds close to the perches in Sink Hollow. A small part of this reduction may be due to predation pressures exerted by raptors. There was no significant reduction of gopher mounds near the main telephone poles. The effect of raptors on gophers near the telephone poles may not be as concentrated as that around the perches, because there are many telephone poles to use, and raptor use is distributed among them. Thus, the predation pressure exerted by the raptors would be distributed over a wider area than that around a lone perch. There was no significance between gopher mound numbers and the distance from the perch on Big Flat. This can possibly be explained simply by the fact that the perch was used only slightly by raptors.

Because gopher mounds tend to be clumped in their distribution, it is

difficult to obtain an accurate measurement of any mound reduction or increase. If the mounds were uniformly or randomly distributed, the statistical analysis of the transect counts would be more reliable, and may even show a better relationship between mound counts and distance from the perches. As it is, there remains a question as to how valid the statistical analysis really is.

From the results of this study, the researcher feels it is safe to conclude that raptors do have an effect on the gopher population of the Strawberry Valley study area, and they help control and reduce the number of gophers in the vicinity of the prey perches. Both the perches and telephone poles are beneficial to the raptors in the taking of prey. Such perches, along with dead tree branches, also appear to be important as observational sites and resting places. Manipulation of artificial perches for raptors should be considered in suitable habitats in order to assist and facilitate raptor predation on rodent pests.

If Strawberry Valley were a suitable year-round habitat for raptors, there could be a pronounced controlling effect of raptor predation on prey populations, especially mountain pocket gophers.

Additional study projects need to be done in order to substantiate the role of prey perches in helping raptors to control prey populations.

Table 4

SUMMARY OF PELLET AND PREY ANALYSIS FOR 1970 & 1971

Location	Number of Pellets* Found & Analyzed		Total Prey Individuals In Pellets And Other Remains					
			No. of Gophers		No. of Myomorphs		No. of Other Species	
	1970	1971	1970	1971	1970	1971	1970	1971
Sink Hollow:								
Perch No. 1	16	9	18	14	6	3	2	4
Perch No. 2	3	9	2	10	1	1	0	4
Perch No. 3	1	14	2	12	1	6	0	3
Main Telephone Line	15+	21	16+	27	6	9	2	9
Old Telephone Line		11		9		5		2
Other		3		1		2		1
Big Flat Area:								
Perch	0	3	0	3	0	1	0	1
Other	2+	1	2	1	2+	1	0	0
Totals:	37+	71	40+	77	16+	28	4	24
Percent of Total Prey Individuals:			64.5%	59.2%	25.8%	21.6%	9.7%	19.2%
Long-eared Owl Nest		8		1		7		0
Percent of Total Prey Individuals from Owl Pellets:				12.5%		87.5%		

*Kestrel pellets with only insect remains are not included.

SUMMARY

In June 1970, two prey perches were erected in the Sink Hollow area of Strawberry Valley, Wasatch County, Utah. One perch had previously been erected by the Forest Service in the Fall of 1968. Telephone lines transect the valley in this area. In July 1970 a prey perch was erected on Big Flat which is on the Mud Creek road west of Strawberry Reservoir.

The perches and the telephone poles were used by rapacious birds for taking prey during the spring, summer, and fall of 1970 and 1971.. The raptors which used the perches and poles were identified as Swainson's hawks, red-tailed hawks, kestrels, great horned owls, and long-eared owls. There appeared to be a seasonal pattern to the movement of the various raptor species into and out of the area.

Raptor pellets and prey remains were regularly collected from under the perches and telephone poles. Sixty-four point five % of the prey individuals from pellets and other prey remains during the 1970 season were those of mountain pocket gophers, 25.8% were myomorph (mouse-type) rodents, and 9.7% were other prey species. During the 1971 season 59.2% of the prey individuals were mountain pocket gophers, 21.6% were myomorph rodents, and 19.2% were other prey species.

Statistical analysis of gopher mound transect counts showed significant reductions of gopher mounds near the three prey perches in Sink Hollow. A small portion of this reduction may be attributable to raptor predation pressures. There was no significant reduction of mounds near the telephone poles or the perch on Big Flat.

The results of the study indicate that rapacious birds do use the perches for taking prey, and appear to have localized controlling effects on mountain pocket gopher populations in the vicinity of the prey perches. Dead tree branches, telephone poles, and manipulated prey perches are important also to raptors as resting places and territorial surveillance sites.